

REMARKS/ARGUMENTS

Claims 1-20 are pending. Claims 1-20 have been rejected. Applicants respectfully traverse the Examiner's rejections.

I. Claims 1-5 were rejected under 35 U.S.C 102(e) as being anticipated by U.S. Pat. No. 6,541,815 to Mandelman et al. For the reasons set forth below, Applicants respectfully traverse this rejection.

Before reviewing the rejection it would be useful to review the invention as claimed as set forth in claims 1-5. In claims 1-5 a non-volatile memory cell is claimed. The non-volatile memory cell has a trench area and a planar surface area, with a first region in the planar area, and a second region in the bottom of the trench. A channel region connects the first region to the second region and has two portions: a first portion that is along the planar surface area adjacent to the first region, and a second portion which is along the sidewall of the trench. Applicants respectfully submit that Mandelman et al. fails to disclose at least these claimed elements of the invention. In particular, Mandelman does not disclose a channel region having two portions: a first portion adjacent to the first region and on the planar surface and a second region along the sidewall of the trench.

The examiner has asserted that Mandelman discloses the channel region having two portions. However, Applicants strenuously dispute this characterization. According to the examiner, Mandelman discloses the channel region having a first portion which is "area between second regions along the sidewall" and a second portion "area along planar surface where D1-2 are located". However, that which is "along planar surface where D1-2 are located" is the first region and is NOT part of the channel region. D1-2 is the drain (see col. 4, line 15) wherein region 50 is described as a "bitline diffusion regions". One of ordinary skilled in the art would understand that a diffusion region is the first region of the second conductivity type and is NOT part of the channel region. Accordingly, the rejection on the basis of Mandelman is in error, for at least this reason.

Furthermore, claim 1, the independent claim recites that a dielectric material is on the channel region with the floating gate on the dielectric, a first gate on the dielectric and a second gate capacitively coupled to the floating gate. Thus, there are three gates recited in claim 1: floating gate, first gate and second gate.

In Mandelman et al. it is seen that there is only a control gate and a floating gate. It is not seen where there are three gates, as recited in Applicants' invention as claimed as set forth in claim 1. Therefore, Mandelman also fails to disclose this aspect of the invention as claimed.

Claims 2-4 are dependent claims and they depend on claim 1. For at least the same reasons, claims 2-4 are patentable over Mandelman et al.

II. Claims 6-11 were also rejected under 35 U.S.C 102(e) as being anticipated by U.S. Pat. No. 6,541,815 to Mandelman et al. For the reasons set forth below, Applicants respectfully traverse this rejection.

Claim 6 is similar to claim 1. However, it recites an array of non-volatile memory cells, with each non-volatile memory cell having some of the same limitations noted herein above for claim 1. Specifically, in claim 6, each of the non-volatile memory cells forming part of the array has a trench area and a planar surface area, with a first region in the planar area, and a second region in the bottom of the trench. A channel region connects the first region to the second region and has two portions: a first portion that is along the planar surface area adjacent to the first region, and a second portion which is along the sidewall of the trench. In addition, a dielectric material is on the channel region with the floating gate on the dielectric, a first gate on the dielectric and a second gate capacitively coupled to the floating gate. Thus, there are three gates recited: floating gate, first gate and second gate.

Similar to the rejection of claims 1-5, with respect to Mandelman et al., Applicants respectfully submit that Mandelman et al. fails to disclose at least a channel region having two portions: a first portion adjacent to the first region and on the planar surface and a second region along the sidewall of the trench. According to the examiner, Mandelman discloses the channel region having a first portion which is "area between second regions along the sidewall" and a

second portion “area along planar surface where D1-2 are located”. However, that which is “along planar surface where D1-2 are located” is the first region and is NOT part of the channel region. D1-2 is the drain (see col. 4, line 15) wherein region 50 is described as a “bitline diffusion regions”. One of ordinary skilled in the art would understand that a diffusion region is the first region of the second conductivity type and is NOT part of the channel region. Accordingly, the rejection on the basis of Mandelman et al. is in error, for at least this reason. Furthermore, in Mandelman et al. it is seen that there is only a control gate and a floating gate. It is not seen where there are three gates, as recited in Applicants’ invention as claimed as set forth in claim 6. Therefore, Mandelman et al. also fails to disclose this aspect of the invention as claimed. Thus, for at least these reasons, the rejection of claim 6 on the basis of Mandelman et al. is in error.

Since claims 7-11 depend on claim 6, the rejection of claims 7-11 on the basis of Mandelman et al. also suffers the same deficiency.

III. Claims 12-20 were also rejected under 35 U.S.C 102(e) as being anticipated by U.S. Pat. No. 6,541,815 to Mandelman et al. For the reasons set forth below, Applicants respectfully traverse this rejection.

Independent claim 12 recites a method of manufacturing an array of non-volatile memory cells. Among the claimed elements of claim 12 is the formation of a floating gate in the trench along the sidewall of the trench and insulated therefrom. In addition, claim 12 recites the formation of a first gate electrode in the trench, insulated from the first region and capacitively coupled to the floating gate. Finally, independent claim 12 recites the formation of a second gate between the second region and the trench. Thus, in all there are a total of three gates, each positioned in some specified locations.

Turning to Mandelman et al., it is clear that Mandelman et al. does not disclose the formation of three gates as recited in claim 12. Specifically, the examiner asserted that the floating gate is met by element 30, the first gate is met by element 80 and the second gate is met

by element 58 of Mandelman et al. Applicants respectfully submit that these elements of Mandelman do not meet the claimed limitations of claim 12.

Specifically, element 80 of Mandelman et al. is electrically connected to element 58 (see Fig. 1). Further, see col. 4, lines 17-19, “[W]ordlines 58 are in contact with a top surface of each control gate region”, wherein the control gate region is defined as element 80 (see col. 4, line 8). Thus, elements 58 and 80 are not distinct and separate gates as required by claim 12. Furthermore, Claim 12 requires that the second gate is formed “spaced apart from the surface between said second region and said trench.” Here again in Mandelman, et al. there is no surface between the second region and the trench as recited in claim 12. In Mandelman et al. the diffusion 50 is between two adjacent trenches leaving no surface between the diffusion region and the trench, over which the second gate 58 can be positioned over. See Fig. 2A, and Fig. 1. Therefore, for this reason, claim 12 is not anticipated by Mandelman et al.

Claims 13-16 are dependent on claim 12, and therefore for the same reasons are patentable over Mandelman et al.

With regard to independent claim 17 which recites a method of manufacturing a non-volatile memory cell, Applicants respectfully submit that Mandelman suffers the same deficiency. Claim 17, similar to claim 12 recites the formation of three gates: a floating gate in a trench, a first gate in the trench capacitively coupled to the floating gate and a second gate spaced apart from the surface between the second region and the trench. For the same reasons discussed heretofore with respect to the inadequacy of Mandelman et al. as applied to claim 12, Mandelman et al is also inapplicable to claim 17.

With respect to claims 18-20, applicants respectfully submit that since these claims depend upon claim 17, the shortcomings of Mandelman et al are equally applicable to claims 18-20.

For the foregoing reasons, it is respectfully submitted that the claims are in an allowable form, and action to that end is respectfully requested.

The Examiner is invited to call Applicants' attorney at the number below in order to expedite prosecution of this application.

The Commissioner is authorized to charge any deficiencies in fees and credit any overpayment of fees to **Deposit Account No. 07-1896** and reference Attorney Docket **No. 351913-992471**.

Respectfully submitted,

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